

THE CAUSTICA GROUP OF THE GENUS *EPICAUTA*
(COLEOPTERA: MELOIDAE)

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Abstract.—The Caustica Group is defined on the basis of characters of courtship behavior and larval and adult anatomy to include the Neotropical species *Epicauta caustica* Rojas; *E. floydwernerii* Martínez (formerly in the Vittata Group); *E. brasileria*, new species (Brazil); and *E. crucera*, new species (Bolivia). Adults of these species are keyed, described, and figured. Courtship behavior and the first-instar larva are described and figured for *E. floydwernerii*. Available ecological information is summarized.

Epicauta caustica Rojas, *E. floydwernerii* Martínez, and two new species of the nominate subgenus of *Epicauta* Dejean form a distinctive, previously unrecognized taxon that I propose to call the Caustica Group. This group occurs in the New World tropics from Panamá and Venezuela south to Bolivia, extreme northern Argentina, and southern Brazil (Fig. 1). It appears to have a major disjunction of range through the heart of the Amazon Basin, but all known species surely have more extensive distributions than shown on the map, and it is not unlikely that additional species await discovery in northern and central Brazil, if not elsewhere.

There are many anatomical similarities between the Caustica Group and Vittata Group in both the adult and larval stages; *E. floydwernerii* was, in fact, included in the latter group by Adams and Selander (1979). Adult feeding behavior and patterns of geographic distribution in South America are also similar. There are, however, major anatomical and behavioral differences, including unusual modifications of the male head and antennae in the Caustica Group that are associated with a highly distinctive form of courtship behavior.

MATERIALS AND METHODS

Twelve males and ten females of *Epicauta floydwernerii* taken 11-12 December 1973 at the Saavedra Agricultural Experiment Station, Santa Cruz, Bolivia, were housed in two plastic cages each measuring 18 by 13 by 10



Fig. 1. Geographic distribution of the Caustica Group. The open circle and square represent, respectively, country and state records.

(height) cm and provided with a floor covering of blotter paper, a dish containing moist (10% water) silica sand (depth 25 mm), and cuttings of plants as food. From 29 December 1973 on, the beetles were held at 25°C under a 12/12 daily photophase.

Courtship behavior was observed in sunlight or under a bank of fluorescent lamps at temperatures ranging from 27°C to 28½°C. The sexes were usually separated for 2–3 days before an observation period. The total duration of all observation periods was about ten hours. Details of the positioning and movement of the male antennae during courtship were determined from 300 ft of 16 mm motion picture film (24 fps) using a projector that permits inspection of single frames.

Egg masses were incubated individually in cotton-stoppered 3-dram glass vials in darkness at 27°C and 100% RH in a commercial environmental chamber. First-instar larvae were killed in 70% ethyl alcohol (in water) and later treated with KOH, dehydrated through an alcohol series, cleared in oil of wintergreen and toluene, and mounted on slides in Harleco Synthetic Resin.

Anatomical descriptions of adults of the group are based on material from the Cornell University Insect Collection, Ithaca, New York; Field Museum of Natural History, Chicago, Illinois; Departamento de Zoología, Secretaria de Agricultura, São Paulo, Brazil; Instituto Miguel Lillo, Tucumán, Argentina; Museo de La Plata, La Plata, Argentina; U.S. National Museum, Washington, D.C.; Universidad Central de Venezuela, Maracay; and my own collection.

In the text, sample means are accompanied, in parentheses, by estimates of their standard errors.

ECOLOGY AND BEHAVIOR

The recorded seasonal distribution of adults of *E. caustica* extends from 30 April to 8 August. Adults of *E. crucera* have been collected in November, those of *E. brasilera* from October to February, and those of *E. floydwerneri* from November to January. Eight of 22 adults of the last species taken in Bolivia in mid-December survived until mid-March, when they were killed.

In the time of Rojas (1857), adults of *E. caustica* were apparently well known to the natives of San Fernando de Apure, Venezuela, as a *plaga del tomate* (*Lycopersicum esculentum* Mill.); a more recent record is from potato (*Solanum tuberosum* L.) at Valencia, Venezuela. At Saavedra, Bolivia, we found adults of *E. floydwerneri* in an area of rank vegetation bordering agricultural fields, where they occurred singly or in small groups on *Amaranthus* sp., particularly delicate plants 20–30 cm in height. Captive adults readily ate leaves and stems of several species of *Amaranthus* as well as leaves of potato and an unidentified, succulent *Solanum* sp. from Paraguay.

Available evidence suggests that the group is primarily nocturnal in the adult stage. Rojas collected specimens of *E. caustica* by placing a light in his window, and several specimens from Panamá are labeled as collected at ultraviolet light. In the case of *E. floydwerneri*, we had difficulty finding adults in the afternoon, obtaining only six individuals in about three hours of searching. However, in a period of two hours beginning at dusk we found 17 individuals (16 collected), nine of which were taken by visiting a single, small *Amaranthus* plant three times. Captive adults were more active at night than in the day. Under bright light they tended to hide under their food material.

Rojas, who reportedly used cantharidin derived from adults of *E. caustica*

in the treatment of "neuralgia," established experimentally that both live adults and alcohol in which adults had been preserved are capable of producing blisters on human skin. Adults were described as flying and running very actively.

Adults of *Epicauta floydwernerii* are among the most wary and easily disturbed blister beetles that I have seen, and on this account, as well as their tendency to shun bright light, it is difficult to study their behavior. Individuals swept into a collecting net invariably folded the antennae and legs against the body and feigned death, a response quite different from the typical running and hiding behavior of adults of the Vittata Group (Adams and Selander, 1979).

Courtship behavior, presently known only for *E. floydwernerii*, is described in the following section.

COURTSHIP BEHAVIOR IN *EPICAUTA FLOYDWERNERII*

Courtship in *Epicauta floydwernerii* may be described conveniently in terms of (1) an *orientation* phase, in which the male stands near the female and tries to grasp her antennae with his own; (2) a *mounted* phase, in which the male is mounted directly over the female and facing in the same direction; and (3) a *precopulatory sequence*, initiated during the mounted phase and terminating in copulation. Before considering courtship behavior as a whole, it will be useful to describe four characteristic acts of male display.

In *antennal wrapping*, the male grasps the female's antennae by winding his own antennae around them. Beginning from above the female's antenna, the male's antenna makes $1\frac{1}{2}$ turns. Invariably the antenna curves like a ram's horn; that is, with respect to its base, the antenna spirals outward, turning clockwise if on the left side of the head and anti-clockwise if on the right (Fig. 2). Intimate contact with the female's antennae is made by the ventral surfaces of segments III-VI. The first turn, involving segments III-V, is tight; the following half turn, beginning with segment VI, is looser.

Antennal coiling is the act of making wrapping-like turns in the antennae without attempting to grasp the female's antennae.

Given the opportunity, a mounted male that has wrapped his antennae around the female's pulls them straight up, aligns them nearly side by side directly in front of his head, and presses their free ends against his epicranium. While *pressing* the female's antennae in this manner, the male usually performs repeated bouts of foretarsal *rubbing*, each consisting of a flurry of rapid but not particularly vigorous strokes of the inner side of the foretarsus against the side of the female's head.

Temporal patterning of courtship behavior.—In reading the following account, it will be helpful to refer to the diagram in Fig. 3.

Orientation phase: On encountering a female at a distance of no more than a few centimeters, the male becomes alert, extends the maxillary palpi

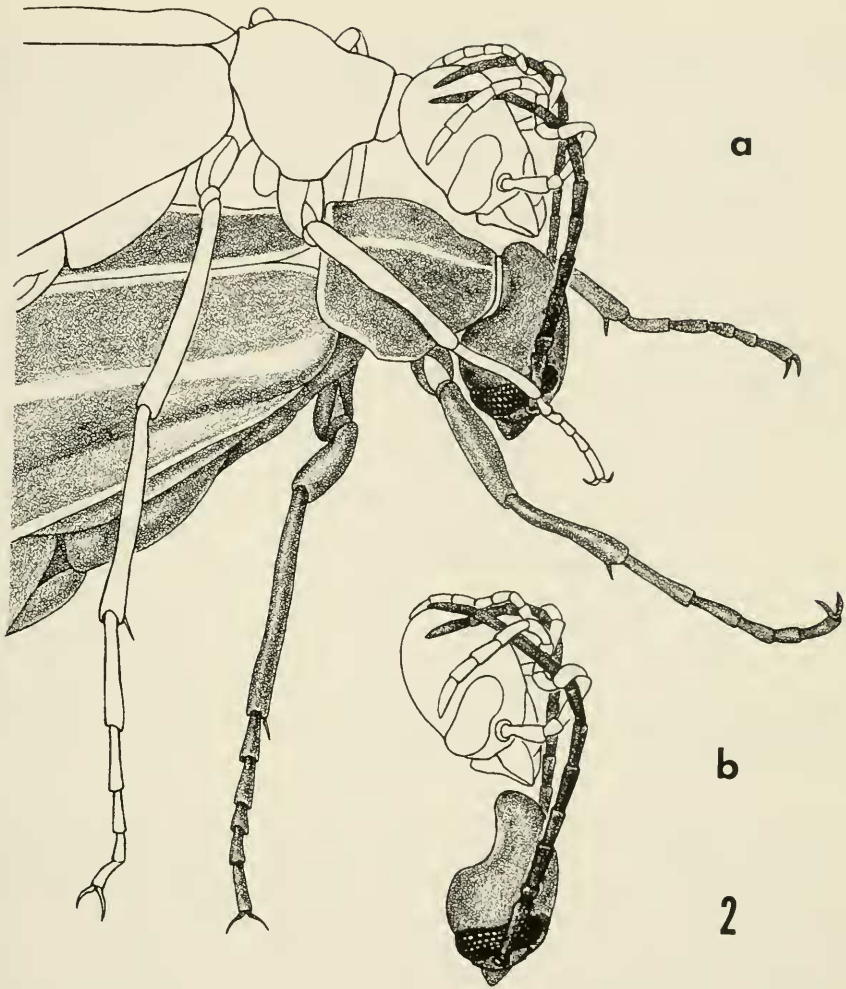


Fig. 2. Courtship behavior in *Epicauta floydwerneri*. a, The male, above female, has wrapped his antennae around hers and pulled them up in front of his head. b, The male presses the ends of the female's antennae against his epicranium.

straight forward, and begins to wave the antennae up and down, alternately, as though seeking or receiving an olfactory stimulus. He then approaches warily, brings the antennae over the female, and folds the palpi to their normal position. While orienting, he may shift his position with respect to the female, but there is no clear tendency to move to the front, as in the Albida Group, or to the rear, as in the Vittata Group. Moreover, there is no antennal contact with the female during courtship except for wrapping and no palpal contact whatsoever.

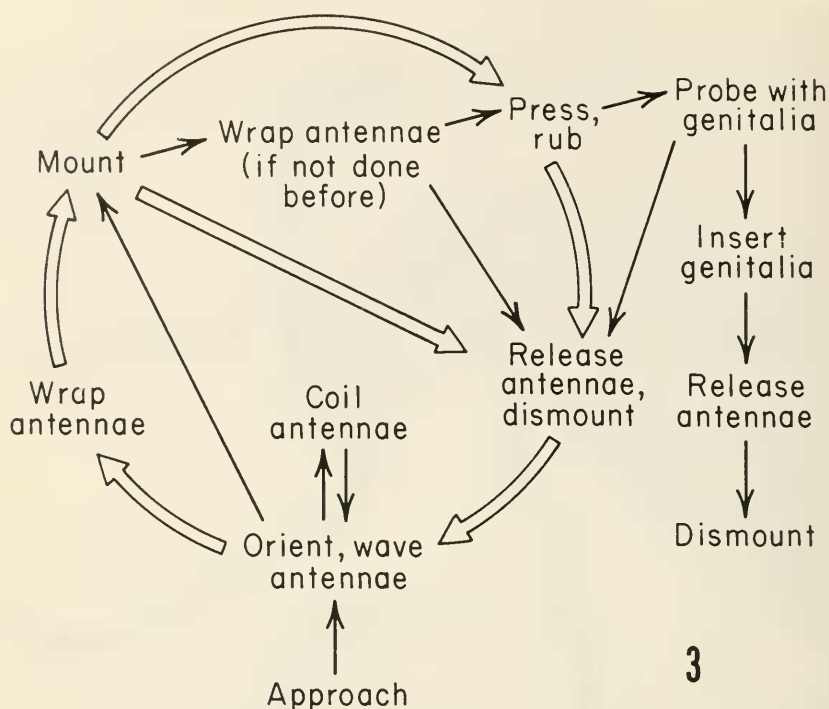


Fig. 3. Sequence of male sexual behavior in *Epicauta floydwernerii*. The more commonly observed transitions are indicated by heavy arrows.

Once the female's antennae are within reach, the male quickly attempts to perform antennal wrapping with one or both of his antennae. In all but a very few cases that I observed the male mounted the female as soon as wrapping occurred. Occasionally, when the female was walking, a male momentarily wrapped one of his antennae around one of hers without trying to mount. In this situation in particular, the agility and speed with which males move their antennae is impressive. By examining single frames of motion picture film, I determined that full wrapping and unwrapping of the antenna may be accomplished within $1/12$ s.

Antennal coiling was observed only in males standing in front of females and then only rarely. It was always preceded and followed by bouts of antennal wrapping.

Mounted phase: Typically, the male is able to wrap only one of the female's antennae while orienting, in which case he immediately attempts to wrap the other one once he mounts. Rarely a male orienting from the rear will mount the female and then attempt to wrap the antennae. In any event, males that cannot control both of the female's antennae on attaining

the mounted position almost immediately release the female and dismount. This pattern of behavior, which characterized perhaps 95% of the 150 or so mounts that I observed, is expressed even if the female does not show an overt negative response.

When the male is mounted, his head is directly over the female's. The forelegs are placed so that the base of the tarsus is against the side of the female's thorax, either in front of her forelegs or behind them. Placement of the other legs by the male is highly variable; in many cases one or more of them remained on the substrate, as in Fig. 2a.

A male that successfully wraps both of the female's antennae brings them rapidly into the pressing position and holds them against his head during the remainder of the mounted phase (Fig. 2b). In general, however, males showed little persistence in the mounted phase unless the female was cooperative. Thus, in response to negative behavior (see below), males usually released the female's antennae and dismounted after only 1–4 s of pressing. Only rarely did the sequence of activities proceed to the point where the male extruded the genitalia.

Precopulatory sequence: If the female becomes still in response to pressing and rubbing, the male extrudes his genitalia and probes with the tip on her dorsum. In response, a receptive female turns the end of the abdomen slightly upward, and the male then inserts his genitalia in hers. Insertion of the genitalia by a small male requires that he first move backward; in doing so, he allows his grasp of the female's antennae to slip distad.

Once the genitalia are coupled, the male suddenly releases the female's antennae and extends his. He then continues to hold his partner loosely with the legs for a short period of time before dismounting by falling over backward. Immediately on dismounting he rights himself and the pair thus assumes the linear copulatory position characteristic of the *Meloinae*.

In one sequence filmed in its entirety, elapsed times from the beginning of pressing to genital extrusion, genital insertion, and release of the antennae were 2, 9, and 10.5 s, respectively. There then followed a period of 95 s before the male dismounted.

Response of the female.—Females of *E. floydwernerii* show little of the tolerance of male attention characteristic of most species of the *Vittata* Group and in this respect more closely resemble females of the *Albida* Group. Low level negative response in the orientation phase of courtship consists of pushing the male with the mid- or hindlegs. If this does not discourage him, the female may attack or threaten to do so. Attacks are not persistent, however, and none that I saw caused injury.

When mounted by a male, an unreceptive female lowers the free antenna (or antennae) to the side of the head and directs it straight back, where it is virtually impossible for the male to wrap it. In addition, she frequently tries to dislodge the male by brushing her legs over her back.

In response to pressing, receptive females become nearly comatose. When the antennae are released the head is lowered to the substrate and the antennae fall limply to either side. Recovery occurs a few seconds after the male dismounts.

Discussion.—Modifications of the male epicranium, antennae, and foretarsi of *E. floydwernerii* of obvious adaptive significance in courtship are described later in this paper. Similar modifications occur in *E. caustica* and *E. brasileria*, and on this basis it is likely that males of both species perform wrapping, pressing, and rubbing much as in *E. floydwernerii*. On the same basis, the male of *E. crucera* probably does wrapping and rubbing, but since the male's head is not much modified, the act of pressing is perhaps quite different in form or absent.

Courtship in *E. floydwernerii* resembles in several respects that of the Albida Subgroup of the Albida Group, as described by Selander and Mathieu (1969). In both taxa the male wraps the antennae around those of the female and intersperses orientation with frequent mounts of short duration. There are, however, numerous differences, and I would not suggest that any of the special similarities are homologous. In particular, in the Albida Subgroup (1) antennal wrapping not only involves different segments but is initiated from beneath the female's antenna, so that the direction of spiraling is reversed; (2) the male does not press the female's antennae against his head; (3) the male behaves in orientation as though attempting to stimulate the female visually; (4) the male antennates and palpates the body of the female; (5) the male raises his middle legs in the precopulatory sequence; and (6) a receptive female solicits mounting by tipping the body.

None of the several patterns of courtship described in the Vittata Group by Adams and Selander (1979) is particularly suggestive of the pattern in *E. floydwernerii*. Moreover, most of the characteristic features of courtship recorded in the Vittata Group, such as antennation, palpation, regularly repeated genital presentation, hindleg rubbing, and head nodding and tucking are lacking in *E. floydwernerii*. Still, there is one similarity that is perhaps highly significant phylogenetically. That is the fact that full antennal curling in the Vittata Group and antennal coiling in *E. floydwernerii* are topologically identical.

OVIPOSITION IN *EPICAUTA FLOYDWERNERI*

During the period 6 January to 16 March 1974, captive females of *E. floydwernerii* laid 21 egg masses, most of which were deposited in the sand provided for that purpose. Inexplicably, embryonic development occurred in only nine of the masses, an abnormally small percentage (42.9%). Moreover, among those nine the mean percentage of eggs developing was only 32.6 (10.47)% and the mean percentage hatching only 15.4 (6.66)%.

The mean number of eggs in 12 masses was 108.3 (6.59), with a range

from 64 (in a mass laid 13 March) to 127. Three masses, including two that produced larvae, contained twice the average number of eggs. Abnormal masses of this nature evidently result from completion of successive reproductive cycles without an intervening oviposition. They have been reported previously in *Epicauta* in the Vittata Group (Adams and Selander, 1979).

Two of the double masses of *E. floydwerner* contained eggs of average size as well as much smaller ones; larvae from these masses were all undersized, evidently because they eclosed from the smaller eggs.

Incubation time in nine masses at 27°C ranged from 22 to 33 days, with a mean of 26.6 (1.06).

THE FIRST-INSTAR LARVA OF *EPICAUTA FLOYDWERNER*

The following description of the first-instar larva of *E. floydwerner* is based on an examination of 36 specimens from nine egg masses laid by females from Saavedra, Santa Cruz, Bolivia.

Description.—Light brown except pronotum, metanotum, and abdominal terga I and VI–VIII and sides of II dark brown. Head surface reticulate dorsally in basal constricted region; pronotum reticulate laterally and posteriorly, the disk and anterior margin smooth; reticulations evaginated on meso- and metanotum only in median anterior region; reticulations strongly evaginated throughout on abdominal terga I–VII, very weakly so on VIII, not so on IX. Head (Fig. 4a) strongly narrowed basally; length of gula slightly greater than $\frac{1}{2}$ greatest width of head; gular setae reaching anterior margin of gula. Antenna with segment II twice as long as III, with inner and outer setae on ventral side nearly equal in length, more than $\frac{3}{4}$ as long as II; sensory organ $\frac{1}{3}$ wider and $\frac{1}{5}$ longer than III, about $\frac{9}{10}$ as long as II. Mandible moderately slender, with about 13 teeth (9 visible in outline); teeth rectangular, prominent. Maxillary palpus with segment III $\frac{2}{5}$ to $\frac{3}{5}$ longer than wide, expanded on outer basal margin; sensory area of III extending about $\frac{2}{3}$ length of segment; papillae moderately long, separated by a distance about equal to their length, not obscuring one another in dorsal view; length of 2-segmented sensory appendix equal to width of segment II of labial palpus at middle. Labial palpus with segment II $2\frac{4}{5}$ as long as wide, with 1 or 2 setae; setae exceeding apex; sensory appendix as large as that of maxillary palpus. Thorax with line of dehiscence well developed and complete on pro- and mesonotum, weakly developed on metanotum; pronotum $\frac{1}{4}$ longer than meso- and metanotum combined. Abdomen with pleurites ventral; sterna I–VII weakly sclerotized, VIII–IX strongly so; 14 setae in posterior marginal row of terga I–VIII; setae not divided; spinelike evaginations at bases of marginal setae moderately developed throughout on terga I–VII, vestigial on VIII, usually with prominent lateral spines; evaginations at bases of median transverse row vestigial; tergum V about 3× as wide as long; setae of posterior marginal row of V as long as tergum; setae of median

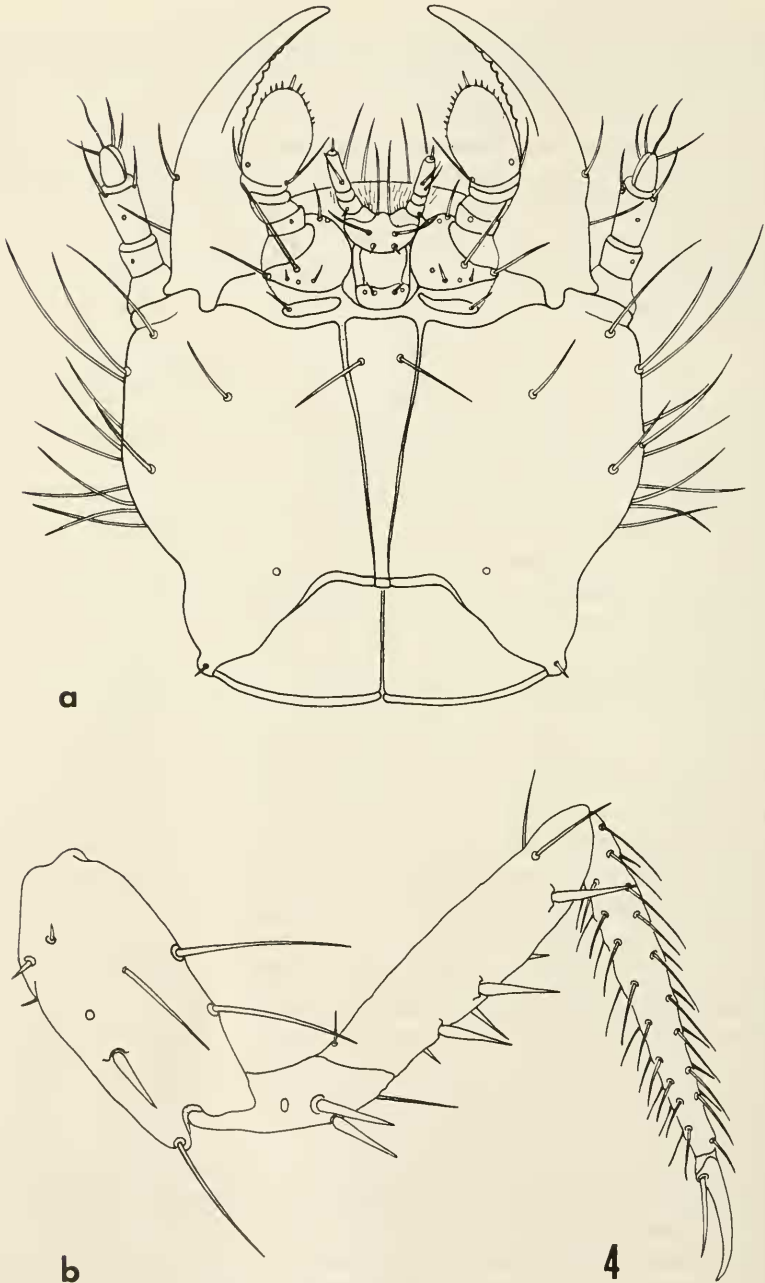


Fig. 4. First-instar (triungulin) larva of *Epicauta floydwerneri*. a, Head, ventral view. b, Leg I, anterior view.

transverse row fine, $\frac{1}{6}$ as long as posterior marginal setae; pleurite V as wide as long, with spiracle in lateral $\frac{1}{3}$; diameter of abdominal spiracle I $\frac{4}{7}$ that of mesothoracic spiracle, $\frac{2}{5}$ greater than that of abdominal spiracle II; spiracles II–VIII equal in diameter; caudal setae shorter than abdominal segments VIII–IX combined. Leg I (Fig. 4b) with coxa about twice as long as wide; femur I with 7 lanceolate setae (3 anterior, 4 posterior), femora II and III each with 7 or 8; tarsungulus I with longer seta reaching apical $\frac{1}{4}$. Body length 2.6–3.4 mm.

Remarks.—Mean body length is 3.4 (.01) mm in 17 larvae from several normal egg masses and 2.7 (.05) in 10 larvae from 2 double masses.

The larva of *Epicauta floydwerneri* agrees in most respects with the description of the larva of the Vittata Group given by Agafitei and Selander (1980). There are, however, several important differences: (1) The terminal seta of antennal segment III is longer; (2) femur I has only seven lanceolate setae; and (3) the reticulations of the abdominal terga are not markedly stronger anteriorly and medianly, as in the Vittata Group, but instead moderately developed throughout. Two setae are present on segment II of each of the labial palpi in about half the specimens of *E. floydwerneri* examined and one in most of the others; two specimens have two setae on one palpus and one on the other.

ADULT ANATOMY

Adults of the Caustica Group are characterized anatomically as follows.

Description.—Head quadrate. Male epicranium often flattened or impressed medianly from level of middle of eyes to vertex or normal in shape; deformation of male head reflected in female but usually to a much lesser degree; surface of male epicranium minutely granulate, satiny in texture, dull, more finely and sparsely punctate than in female; pubescence of median area of male epicranium absent or shortened and sparse, at least near midline. Male antennal callosities much enlarged, deeply dimpled, smooth, very shiny, glabrous, the smooth area on each side extending obliquely mesad and fusing between eyes to form an arch in some species. Antenna slender, filiform except for modification of basal segments in male. Male antenna with segments I–V swollen, sparsely punctate, shiny; ventral surface of III–V flattened, excavate, impunctate, glabrous, the impression lined anteriorly with very short, thick, black, spinelike setae or not; VI broadened, flattened but not excavate ventrally, with or without spinelike setae, with at least dorsal surface like that of following segments. Pronotum with a median pale vitta, sometimes marked in pubescence only. Foretibial spurs spinelike, subequal in both sexes. Hindtibial spurs moderately thickened, obliquely truncate except in *E. crucera*. Male foretarsus somewhat thickened, with tarsal pads better developed than in female. Elytra with dark vittae exten-

sive, fused apically, so that pale areas between them appear as a pale discal vitta and a less distinct pale lateral one (sometimes absent).

Remarks.—The enlargement of the antennal callosities is a functional correlate of the prominent role of the male antennae in courtship behavior. In particular, the mesal extension of the callosities to form a frontal arch would seem to reflect strengthening of the musculature involved in bringing the female's antennae together in front of the male's head and holding them there during pressing. The texture of the epicranial surface of the male is unusual for Meloidae; possibly it facilitates the distribution of a glandular product on the cuticle. The modified segments of the male's antennae are, as we have seen, precisely those making intimate contact with the female's antennae in the courtship act of wrapping.

KEY TO SPECIES (ADULTS) OF THE CAUSTICA GROUP

1. Epicranium not deformed; male antennal callosities not fused medianly between eyes; male antennal segments III–V lacking a row of spinelike setae ventrally; head and pronotum orange, black maculate. Bolivia *E. crucera*, new species
- Epicranium flattened or impressed, more strongly so in male than in female; male antennal callosities fused medianly between eyes; male antennal segments III–V usually with a row of spinelike setae ventrally; color variable 2
2. Head orange, black maculate; pronotum and elytra largely dark brown; epicranium very deeply impressed in male, moderately so in female. Panamá to Venezuela *E. caustica* Rojas
- Head chestnut brown, immaculate; epicranium shallowly impressed or flattened. Central South America 3
3. Elytra tan or light brown, generally paler than head and pronotum; epicranium impressed in both sexes; median area of epicranium glabrous in male; pubescence on head largely white
..... *E. brasileria*, new species
- Elytra chocolate brown, darker than head and pronotum; epicranium flattened; median area of epicranium sparsely pubescent in male; pubescence on head largely black *E. floydwerneri* Martínez

Epicauta caustica Rojas

Figs. 5a, 6a

Epicauta caustica Rojas, 1857: 441 [Type-material from San Fernando de Apure, Apure, Venezuela, presumably lost; NEOTYPE, ♂, from San Juan de los Morros, Guarico, Venezuela, 8 August 1964, J. and B. Bechyne, in the collection of the Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay, hereby designated]. Denier, 1935a: 22; 1936b: 154.

Lytta caustica, Haag-Rutenberg, 1880: 53.

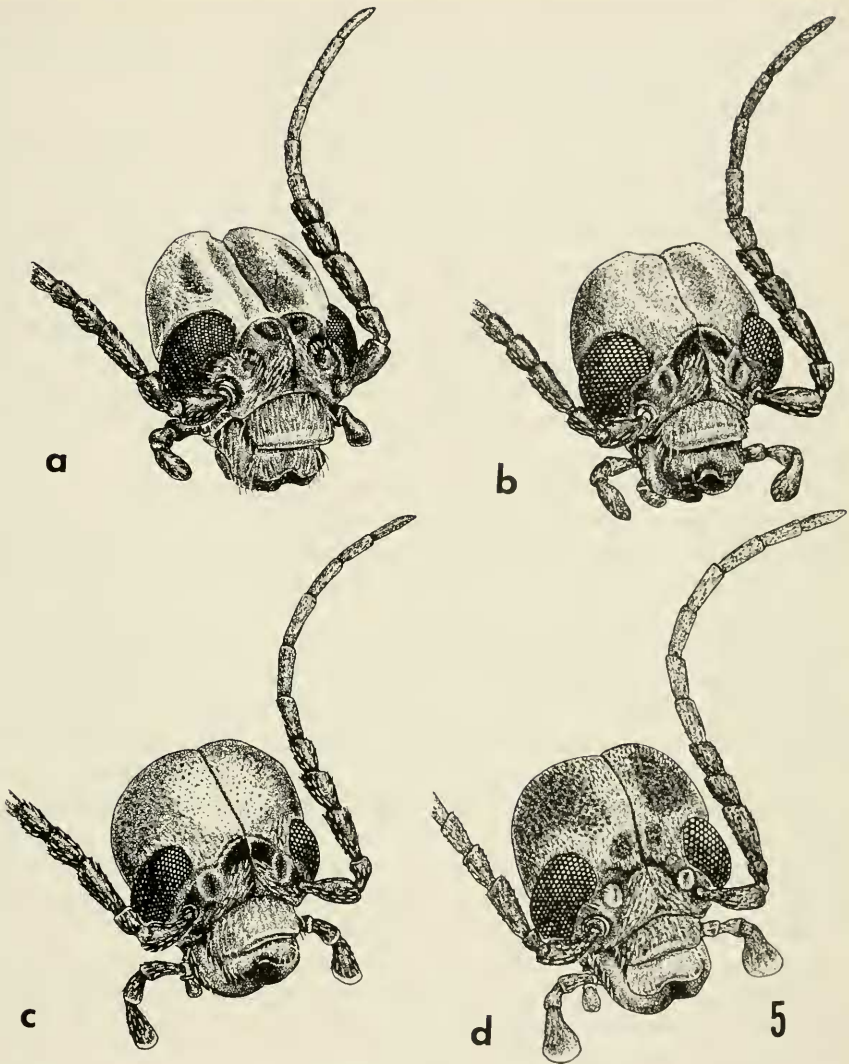


Fig. 5. Heads of males. a, *Epicauta caustica*. b, *E. brasileria*. c, *E. floydwernerii*. d, *E. crucera*.

Description of adult.—Length 11–19 mm. Head orange with a pair of small, narrowly separated black spots on front between eyes and a pair of large black spots on epicranium halfway between upper margin of eyes and vertex (lacking in one male from Venezuela); pubescence white except (usually) on and around large black spots. Antenna and palpi black. Pronotum dark brown except for a broad orange-testaceous median vitta, which is paler than head except at apex; vittae at middle little more than $\frac{1}{4}$ width

of pronotum, gradually widened anteriorly and posteriorly; setae white on vitta and margins, brown, finer, not greatly affecting coloration elsewhere. Scutellum orange testaceous, densely white pubescent. Elytra dark brown, densely clothed with brown recumbent setae (as on pronotum), except on margins and discal vitta, which are orange testaceous and densely clothed with white setae; discal vitta extending to near apex, as wide as pronotal vitta at its middle, very cleanly delimited, as is the white margin; lateral pale vitta marked in pubescence only, rather diffused, usually vestigial; entire elytral surface sparsely, regularly set with long, thick, nearly erect sericeous brown setae. Venter of thorax dark brown, densely, finely pubescent, the setae brown laterally, becoming white on ventral $\frac{1}{2}$. Legs brown; pubescence fine, whitish, especially fine on anterior surfaces of mid- and hindfemora. Abdomen dark brown; pubescence dense, sericeous brown, except white on posterior margins of sterna. Pronotum $\frac{35}{40}$ as wide as long; sides parallel for basal $\frac{3}{4}$.

Male: Epicranium very deeply, broadly impressed medianly from middle of eyes to vertex, which is deeply notched; surface for most part minutely granulate; impression impunctate, glabrous; pubescence at tempora shorter and sparser than in female; front smooth, incorporating spots between eyes. Antennal segments I–V strongly swollen; ventral surface of segments III–VI lined anteriorly with spinelike setae; VI clearly broadened, ventrally flat and glabrous; ratio of lengths of segments I–XI (to a total length of 1000) 125, 87, 125, 68, 58, 77, 102, 100, 110, 108, 140; segments I and III less than $\frac{1}{2}$ as wide as long, IV nearly $\frac{9}{10}$, V nearly quadrate, VI $\frac{6}{10}$ as wide as long, VII–VIII about $\frac{4}{10}$, IX–X about $\frac{3}{10}$, XI about $\frac{1}{4}$.

Female: Head impressed but not nearly so deeply as in male; impression punctate and pubescent.

Nomenclature.—This species was incorrectly synonymized with *E. capitata* (Castelnau) by Wellman (1910: 23) and was listed in the synonymy of both that species and *E. philaemata* (Klug) by Borchmann (1917).

Geographic distribution.—Canal Zone of Panamá eastward to the states of Guarico and Bolívar, Venezuela (Fig. 1). The species has not been reported previously from Panamá and is not presently recorded from Colombia, although it undoubtedly occurs there.

PANAMÁ: *Canal Zone:* Barro Colorado Island, 23 June 1948, 1; 10/17 May 1964, 1; 17 October 1964, Duckworth, 3; 23 June 1967, 2; 3 July 1967, 1. VENEZUELA: *Apure:* San Fernando de Apure, 230 m [Rojas, 1857]. *Bolívar:* La Vergarena, 17 July 1955, 2. *Aragua:* Maracay, 450 m, 12 July 1965, Rivas, 1. *Carabobo:* Naguanagua, 30 May 1966, Díaz Sierra, 1; Valencia, 3 June 1939, 5. *Guarico:* Ortiz, 2 July 1950, 2; San Juan de los Morros, 8 August 1964, Bechynes, 5. *Tachira:* La Fría, 300 m, 10 June 1972, Joly, 1. *Zulia:* Carrasquero, km 20, 2 May 1960, Rosales, 2; El Tucucu, 420 m,

21/27 May 1971, Rosales et al., 5; km 80, carretera entre Valera [in Trujillo] and Maracaibo, 30 April 1960, 3.

Epicauta brasiler Selander, NEW SPECIES

Figs. 5b, 6b

Description of adult.—Length 11–14 mm. Head and pronotum chestnut brown. Antenna and palpi piceous. Elytra tan to light brown, generally paler than head and pronotum. Venter and legs darker brown. Head immaculate, sparsely white pubescent. Antenna and palpi piceous. Pronotum sparsely white pubescent, with a median pale vitta marked in pubescence only, generally poorly defined. Elytra with pubescence usually white, in which case the margins and vittae are marked only by the setae being denser than elsewhere; pubescence varying to brown, in which case margins and vittae are more conspicuous; in any case, cuticle not paler beneath margins and vittae; vittae similar in size to those of *E. caustica* but less well differentiated from rest of surface; lateral vitta absent in 1 specimen; lateral white margin of elytra much wider than sutural one, not sharply delimited; surface with long setae nearly recumbent, pale, not conspicuous. Venter entirely white pubescent. Pronotum $\frac{8}{10}$ to nearly $\frac{9}{10}$ as wide as long; sides parallel for basal $\frac{3}{4}$.

Male: Epicranium shallowly, very broadly impressed medianly from middle of eyes to vertex; impression impunctate, glabrous; pubescence at tempora shorter and sparser than in female. Antenna with segments I–V not quite so strongly swollen as in *E. caustica*; ventral surface of III–V lined anteriorly with spinelike setae; VI not so broad as in *E. caustica*, flattened ventrally but not glabrous and with spinelike setae frequently absent; ratio of lengths of segments I–XI (to a total length of 1000) 97, 51, 105, 73, 66, 75, 97, 107, 105, 102, 122; segment IV $\frac{7}{10}$ as wide as long, V $\frac{2}{3}$, VI $\frac{1}{2}$, VII–X about $\frac{3}{10}$, XI about $\frac{1}{4}$.

Female: Head more shallowly impressed but definitely so; impression punctate and pubescent.

Type designation.—Holotype, ♂, from S[ão] Domingos, Mato Grosso do Sul, Brasil, October 1949, deposited in the Field Museum of Natural History.

The holotype was selected because of its good physical condition. Unfortunately, with four settlements of the name "São Domingos" in Mato Grosso do Sul (United States Board on Geographic Names, 1963), the type-locality cannot be identified precisely.

Geographic distribution.—States of Goiás, Mato Grosso, Mato Grosso do Sul, and São Paulo, Brazil (Fig. 1).

BRAZIL: *Goiás*: Campinas, February 1936, 1; Rio Verde, 1. *Mato Grosso*: R[io] das Mortes [incorrectly specified as in Goiás], 9 Novem-

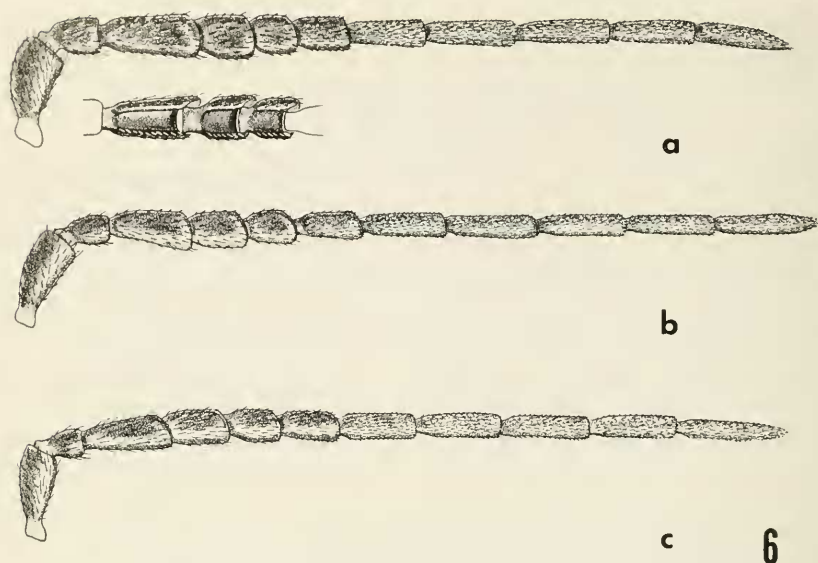


Fig. 6. Antennae of males. a, *Epicauta caustica*. b, *E. brasileria*. c, *E. floydwernerii*.

ber 1937, 6. *Mato Grosso do Sul*: Corumbá, 1; São Domingos [ambiguous; not mapped], October 1949, 5. *State Unknown*: Santa Cruz, P. Ringer, Halle, 1. *São Paulo*: State label only, 3.

Epicauta floydwernerii Martínez

Figs. 5c, 6c

Lytta rubriceps Blanchard, in Blanchard and Brullé, 1843: 200, pl. 15, fig. 8 [Type material from the province of Santa Cruz, Bolivia, presumably in the Muséum National d'Histoire Naturelle, Paris].

Epicauta rubriceps, Borchmann, 1917: 80 (in part). Denier, 1935a: 24 (in part); 1935b: 159 (in part).

Epicauta floydwernerii Martínez, 1955: 58 [New name for *E. rubriceps* (Blanchard, 1843), not *E. rubriceps* (Redtenbacher, 1842: 535)].

Description of adult.—Length 9–17 mm. Head and pronotum deep chestnut brown. Antenna and palpi black. Elytra and venter of thorax rich chocolate brown. Legs brown. Abdomen chocolate brown to dark brown. Head immaculate; surface for the most part finely punctate, minutely granulate, satiny; pubescence short, sparse, that on midline at vertex, around eyes, and on underside of head white, the rest black; epicranium flattened, equally so in the sexes. Pronotum $\frac{7}{10}$ as wide as long; sides parallel for basal $\frac{3}{4}$; pubescence black except on deflexed lateral areas, anterior and posterior margins, and along fine median vitta; vitta about $\frac{1}{7}$ width of pronotum at

middle, flared to base of pronotum; cuticle not paler beneath margins and vitta. Elytra black pubescent except finely, cleanly margined with white pubescence and with a pair of neat white vittae; outer vitta generally less densely pubescent, arising at about basal $\frac{1}{4}$, although it may extend forward (marked by few pale setae only) to join discal vitta at humerus; cuticle of margins and discal vitta about same color as head and pronotum; lateral vitta not or not so well marked in cuticle; long, nearly erect setae confined to apical region. Venter of thorax with pubescence black or dark at sides, becoming white in middle $\frac{1}{2}$. Legs largely gray-white pubescent. Abdomen black pubescent except for white fringing setae.

Male: Epicranium flattened, not impressed, more finely punctate and with sparser black setae than in female, especially medianly. Antenna with segments I–V slightly less strongly swollen than in *E. brasileria*; ventral surface of III–V lined anteriorly with spinelike setae; VI hardly broadened, flattened and with spinelike setae ventrally but not glabrous; ratio of lengths of segments (to a total length of 1000) 94, 47, 100, 72, 66, 81, 98, 104, 106, 106, 126; segment IV less than $\frac{7}{10}$ as wide as long, V $\frac{6}{10}$, VI $\frac{4}{10}$, VII–IX about $\frac{3}{10}$, X $\frac{1}{4}$, XI $\frac{1}{5}$.

Female: Front of head flattened, as in male.

Geographic distribution.—Southeastern Boliva, northern Argentina, and Paraguay (Fig. 1). There is a female in the Pereira Collection labeled "Paraiba/Arena/7.VI.953," presumably from the state of Paraiba, Brazil. The extension of range is so great that, under the circumstances, I am inclined to question the accuracy of the label.

ARGENTINA: *Formosa*: Formosa, November 1952, Peña, 1. *Misiones*: San Ignacio, Bades, 1; province label only, Rodríguez, 2. BOLIVIA: *Santa Cruz*: [San José de] Chiquitos, 700 m, November 1959, 2; El Cidral, 1/28 January 1962, Golbach, 4; Saavedra Agricultural Experiment Station, 11/12 December 1973, Selander and Bouseman, 22. PARAGUAY: Country label only, 1.

Epicauta crucera Selander, NEW SPECIES

Fig. 5d

Description of adult.—Length 9–10 mm. Head orange: much of epicranium on each side of midline occupied by a large black spot that extends onto the front between the eyes where it is interrupted, producing a small, round spot on each side of midline; pubescence black, regular. Antenna and palpi black. Pronotum fully $\frac{9}{10}$ as wide as long; sides slightly divergent from base to apical $\frac{1}{4}$; color orange, with an extensive lunate black spot on each side; surface densely, rather coarsely punctate, moderately shiny; pubescence black on black spots, sericeous yellow elsewhere, not affecting coloration. Elytra dark brown with a narrow discal vitta and lateral margin straw yellow; surface finely punctate, minutely granulate; pubescence black

except yellow on vitta and lateral margin; thick, nearly erect setae absent; discal vitta sharply delimited, very narrow; pale lateral margin very narrow, extending to about apical $\frac{1}{5}$ of elytron; lateral vitta faintly suggested by a few yellow setae. Venter dark brown; pubescence fine, off-white, the setae thicker and more conspicuous along posterior margins of abdominal sterna. Legs dark brown, largely off-white pubescent; hindtibial spurs thicker than those of fore- and midlegs but not so thick as in other species of the group, not flared, flattened posteriorly, not obliquely truncate.

Male: Head with epicranium neither impressed nor flattened; antennal callosities enlarged, deeply dimpled but not extending mesad to form an arch; epicranial surface minutely granulate, satiny, rather densely punctate except along midline; pubescence sparse. Antenna not so elongate and slender as in other species; ventral surface of III–VI lacking spinelike setae; VI hardly broadened, flattened and glabrous in basal $\frac{2}{3}$; ratio of lengths of segments I–XI (to a total length of 1000) 125, 47, 125, 75, 75, 100, 107, 110, 103, 109, 154; segment IV nearly $\frac{4}{5}$ as wide as long, V $\frac{2}{3}$, VI more than $\frac{4}{10}$, VII–VIII less than $\frac{4}{10}$, IX–X $\frac{1}{3}$, XI more than $\frac{1}{4}$.

Female: Unknown.

Type designation.—Holotype, ♂, from [San José de] Chiquitos, 700 m, Santa Cruz, Bolivia, November 1959, from Walz, formerly in my collection, deposited in the Field Museum of Natural History.

Geographic distribution.—The species is known only from the type-locality, in southeastern Bolivia, where it occurs with *E. floydwernerii* (Fig. 1).

BOLIVIA: *Santa Cruz:* [San José de] Chiquitos, 700 m, November 1959, 2.

Remarks.—The male antennae are similar to those of *E. floydwernerii* but lack the ventral spinelike setae. The antennal callosities are less modified than in other species of the group. The shape of the epicranium is normal, although the surface is modified.

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